REMARKS

Claims 1-11 and 13-21 are pending in the application, with claims 1-8 and 14-21 having been withdrawn from consideration. The rejections directed to claims 9-11 and 13 are respectfully traversed below.

Claim Rejections under 35 U.S.C. §103

Claims 9-11 and 13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Applicant's admitted prior art in view of Wang (U.S. Patent No. 6,188,011 B1).

The present Office Action specifically stated that "APA does not teach the source and drain containing a substance having an accelerated oxidation suppressing function." The Applicant agrees with the Office assessed shortcoming of the APA. However, this is by no means the only shortcoming of the APA.

In rejecting the claimed invention, the Office Action specifically cited Figure 16D and associated written description on page 5 line 3 to page 6 line 11 of the written specification. This is disclosed to be prior art 3. It should be noted that regarding Figure 16 specifically, page 7 line 21 to page 8 line 7 of the written specification, states that:

> "In the manufacturing method described in the prior art 3, due to accelerated oxidation through each annealing process for the impurity diffusion to form the bit lines 104 and the formation of the ONO film 102, the sacrificial oxide film 106 above the bit lines 104 may increase its thickness, and large bird's beaks may also grow.
>
> As described above, in manufacturing a semiconductor memory having a buried bit line structure, it is difficult to ensure electrical insulation between the bit lines and the word lines, or even when electrical insulation can be ensured, it may cause bird's beak formation and considerably degrades the charge holding characteristic. These are serious problems."

Therefore, according to the APA, it is committed to an accelerated oxidation through each annealing process for the impurity diffusion to form the bit lines 104 and the formation of the ONO film 102. Associated problems related to this process are that there is a growth of large bird's beaks and there is also a difficulty in ensuring electrical insulation between the bit lines and the word lines. This means there will be short circuits between the bit lines and the word lines. It is further noted that even if electrical insulation can be ensured, bird's beak formation will cause considerable degradation of the charge holding characteristic. It is well known to a personal of ordinary skill in the art, a considerable degradation of the charge holding characteristic will merely cause a device to be at best unreliable and at worst unworkable. Even if Wang is combined with APA, exactly as suggested by the Office, the combination would still contain the same serious problems. Therefore, the APA is simply defective.

Furthermore, as explained in the previous response, as a major precondition, the present invention focuses on a so-called buried bit line type semiconductor device as claimed in claim 9. In order to solve the characteristic problems pertinent to the buried bit line type semiconductor device, the present invention requires ensuring electrical insulation between a gate electrode and source and drain regions (condition 1), and also requires suppressing undesirable bird's beak formation in advance (condition 2). In addition, the source and drain regions is formed by introducing a substance having an accelerated oxidation suppressing function, such as nitrogen.

In the present invention, the substance having an accelerated oxidation suppressing function is introduced so that the lowermost layer of the ONO film is appropriately thicker at portions above the source and drain region than at other portions. This construction indeed satisfies

both conditions 1 and 2, which are apparently inconsistent. In other words, this construction makes it possible to ensure the electrical insulation, and to suppress undesirable bird's beak formation.

On the other hand, in Wang, as apparently shown in Figs. 1 to 4, a normal transistor structure is employed, in which source and drain are formed on both sides of a gate electrode of a semiconductor substrate. Wang discloses the art for reducing diffusion of source and drain by introducing nitrogen after forming the gate electrode, in order to reduce short channel effect of Flash EPROM.

As discussed above, the present invention and Wang have completely different preconditions from each other. The present invention discloses that the substance having an accelerated oxidation suppressing function is introduced to the source and drain in order to solve the characteristic problems.

Basically, the Examiner asserted that, as in the preceding Office Action, the present invention is obvious from APA (prior art 3) in view of **Wang** (USP 6,188,101).

In the present specification, prior art 3 is described in order to point out the problems (defects) of increase of thickness and bird's beak formation due to accelerated oxidation.

On the other hand, **Wang** is to combat the problem of short channel effect including the reduction of doping in a source side implant. Accordingly, even if prior art 3 and **Wang** are combined, the problems of increase of thickness and bird's beak formation due to the accelerated oxidation still remain, and further, since both of them fail to disclose the contruction to solve the problems of claim 9 of the present invention, the combination of prior art 3 and **Wang** still do not achieve the present invention.

Amended claim 9 makes it clear that the semiconductor device of the present invention is a product which is constructed to solve the problems of increase of thickness and bird's beak formation due to accelerated oxidation. In particular, independent claim 9 was amended to recite:

> "wherein said second insulating film as ~~the~~ a lowermost layer of said multilayer film is formed thicker at portions immediately above said source and drain regions than at other portions, and
>
> wherein said lowermost layer of said multilayer film is in direct contact with said source and drain regions."

This aspect of the claimed invention is shown, by way of example only, in Figure 1C, wherein ONO film layer 6 has three layers, 21, 22 and 23. Layer 21 is made of silicon oxide film which is an insulating film located at the lowermost of all the layers and is formed thicker at portions immediately above said source 5 and drain 5 regions than at other portions. In addition, the lowermost layer of said multilayer film is in direct contact with said source and drain regions.

In contrast, in Figure 16D, the lowermost layer 111 is not formed thicker at portions immediately above said source 104 and drain 104 regions than at other portions, and the lowermost layer of said multilayer film is not in direct contact with said source and drain regions. Separating the lowermost layer 111 and the source 104 and drain 104 is a sacrificial oxide film 106.

For at least these reasons, amended independent claim 9 patentably distinguishes over the prior art, either alone or in combination. Therefore, these rejections should be withdrawn. Accordingly, the present application is now in condition for allowance.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 50-2866.

Respectfully submitted,

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